

## RIVER STAGES AND FLOODS

By BENNETT SWENSON

Record breaking floods occurred during October in parts of the Potomac and Rappahannock River Basins from an extended period of extraordinarily heavy rainfall. The flood was especially severe in the Shenandoah River where stages exceeded the high water of March 1936, the previous maximum flood of record, by several feet. In other parts of the Potomac Basin, the stages approached or exceeded the flood levels established in 1936.

In other parts of the country, floods were notably absent except in the James River Basin, eastern North Carolina, and parts of Texas. Stages were unusually high in some of the smaller northern tributaries of the James River; otherwise the floods were light to moderate.

*Atlantic Slope drainage.*—A flood of unusual magnitude developed in the Potomac and Rappahannock River Basins on October 14. Before the 19th, when the flood waters had subsided, higher stages than ever had been recorded occurred in the Shenandoah River and in parts of the Rappahannock River Basin. At other places in the Potomac Basin, the flood closely approached or exceeded the previous maximum stages of record, most of which were established in March 1936. A table showing, flood heights at selected points in the Potomac Basin and comparisons with previous high stages of record, is given below.

The flood was caused by an extended period of unusually heavy rainfall. Rains began on the 12th in the southern parts and rapidly spread over all parts of the basins, continuing at many points until the morning of the 17th. Excessive rains occurred on the 13th, 14th, and 15th, and the amounts were heaviest in the Shenandoah and Rappahannock Basins. Several stations in these basins reported totals of more than 12 inches; the largest official amounts measured were 18.9 inches at Big Meadows, Va., on the divide between the Shenandoah and Rappahannock, and 17.6 inches at Front Royal, Va., in the Shenandoah Basin. Unofficial measurements indicate that more than 25 inches of rain fell at a point 6 miles north of Front Royal, and approximately 20 inches at several other places in the middle Shenandoah and upper Rappahannock Basins.

The rainfall was induced by a persistent cyclonic circulation which was centered over southeastern Virginia from the 13th to 17th. The circulation was originally established by a dissipating tropical disturbance which carried a very deep current of moisture-laden air over the headwaters of the Potomac River. A stagnant anticyclonic circulation over the northeastern United States helped to intensify the pressure gradient over northern Virginia so that persistent easterly winds caused orographic rains on the windward slopes of the Appalachian Mountains. These rains combined with other convective showers, caused by lifting and convergence of the moist air brought in by the tropical disturbance, to produce a four-day period of record rainfall.

The unusually intense rains in the Shenandoah Basin produced rapidly rising stages in the streams. At River-ton, Va., the river reached flood stage (22 feet) about 10 a. m. of the 15th and by the next morning had reached a crest stage of 46 feet. The previous highest stage of

record at that place was 37.5 feet in March 1936. By 3 p. m., the Shenandoah crested near its mouth at a stage 6 feet higher than the 1936 flood.

The rainfall totals decreased rapidly in amount from the Shenandoah Basin westward over the South Branch of the Potomac Basin, where the totals ranged from slightly over 2 inches in the headwaters to 6 inches in the lower portion. Northwestward from this point the totals increased again with another small center of heavy rainfall of more than 8 inches located over the North Branch of the Potomac Basin. In the extreme north portion of the Potomac Basin the precipitation was relatively light, averaging about 4 inches.

The South Branch of the Potomac River crested at Springfield, W. Va., on the morning of the 16th at a stage of 13 feet lower than the flood of March 1936 at that place. The crest at Cumberland, Md., 24.0 feet in the afternoon of the 15th, was only 5 feet below the 1936 crest. In the main Potomac, the crests were as follows: Hancock, Md., 36.6 feet; Harpers Ferry, W. Va., 33.8 feet; and Washington, D. C., 17.5 feet. The stages in the main Potomac were lower than the 1936 flood crests except at Washington where the gage at the foot of Wisconsin Avenue registered a stage 0.3 foot higher than the record stage established in March 1936.

Considerable damage resulted from the high waters, especially in the Shenandoah and Rappahannock Basins. As reports on the damage, precipitation, and other features of the flood are not complete at this time, a further report will be made in a later issue of the REVIEW.

The storm that caused the flood in the Potomac Basin also produced high water in portions of the James River Basin. The greater portion of the rain in this area occurred in a limited area embracing the Tye, Rockfish, and Rivanna River Basins. Floods of high proportions resulted in these basins and moderately high flood stages occurred in the James River from the mouth of the Tye River, downstream. Most of the damage occurred in the tributary flooding, the total losses exceeding \$200,000.

The height of the flood crest in the lower James River was the highest since the flood of August 1940. At Richmond, Va., a stage of 19.5 feet occurred on October 17th.

Light to moderate flooding occurred in the Roanoke, Tar, and Neuse Rivers in North Carolina from the 14th to 28th, from rains which continued from the 11th to 16th. Rocky Mount, N. C., reported a 24-hour precipitation amount of 6.6 inches and Goldsboro, N. C., 7.77 inches on the morning of the 12th. There was no damage of consequence except in the Neuse River Basin where a total loss of about \$100,000 was suffered.

*West Gulf of Mexico drainage.*—Heavy rains over the upper Trinity River watershed on October 15th to 18th caused considerable flooding of the lowlands immediately below Dallas, Tex., but only slight overflows occurred elsewhere. The damage as the result of the flood was light.

Heavy rains during October 16–17 over the San Saba River Basin caused some flooding in that stream. A crest of 30.5 feet was reached at San Saba, Tex., on the 18th. A large run-off occurred in the middle and upper Colorado River during the period October 17–20, but flood stage was not reached in the Colorado itself.

## Summary of flood stages in Potomac Basin for flood of October 1942

## FLOOD-STAGE REPORT FOR OCTOBER 1942—Continued

River and station	Miles above Washington	Years of record	Maximum flood of record			Maximum during flood of October 1942		
			Date	Time <sup>2</sup>	Stage (feet)	Stage (feet)	Date	Time <sup>1</sup>
North Branch of Potomac, Cumberland, Md.	196	41	Mar. 17, 1936	11:30 p. m.	29.1	24.0	15	4 p. m.
South Branch of Potomac, Springfield, W. Va. <sup>3</sup>	193	18	Mar. 18, 1936	5:30 a. m.	34.2	21.1	16	5:30 a. m.
North Fork of Shenandoah, Cootes Store, Va.	188	18	Mar. 17, 1936	8 p. m.	23.25	25.2	15	3 p. m.
South Fork of Shenandoah, Lynnwood, Va.	198	13	Mar. 18, 1936	4 a. m.	26.6	27.2	15	8:15 p. m.
Shenandoah, Riverton, Va.	118	35	do.	10 a. m.	37.5	46.0	16	4 a. m. <sup>4</sup>
Potomac:								
Hancock, Md.	127	18	do.	6 p. m.	47.6	36.6	16	3 p. m.
Williamsport, Md.	98	11	do.	10 p. m.	48.6	36.1	16	7 p. m.
Harpers Ferry, W. Va.	60	52	Mar. 19, 1936	5 a. m.	36.5	33.8	16	6 p. m.
Washington (near), D. C. (Leiter gage).	6	13	do.	4:45 p. m.	28.1	26.9	17	5:45 a. m.
Washington, D. C. (Wisconsin Ave. gage).	0	76	do.	7 p. m.	17.2	17.5	17	7 a. m.

<sup>1</sup> Eastern standard time.<sup>2</sup> Gage heights from U. S. Geological Survey gage.<sup>3</sup> From flood marks.<sup>4</sup> Approximate.

## FLOOD-STAGE REPORT FOR OCTOBER 1942

River and station	Flood stage	Above flood stages—dates		Crest	
		From—	To—	Stage	Date
ATLANTIC SLOPE DRAINAGE					
North Branch of Potomac: Cumberland, Md.	<i>Feet</i> 17	15	16	<i>Feet</i> 24.0	15
South Branch of Potomac: Springfield, W. Va.	15	15	16	18.9	16

River and station	Flood stage	Above flood stages—dates		Crest	
		From—	To—	Stage	Date
ATLANTIC SLOPE DRAINAGE—continued					
North Fork of Shenandoah: Cootes Store, Va.				25.2	15
South Fork of Shenandoah: Lynnwood, Va.				27.2	16
Shenandoah: Riverton, Va.	22	15	17	46.0	16
Potomac:					
Hancock, Md.	30	15	17	36.6	16
Williamsport, Md.	23	15	17	36.1	16
Harpers Ferry, W. Va.	18	15	18	33.8	16
Washington (near), D. C.	10	15	19	26.9	17
Washington, D. C.	7	16	18	17.5	17
James:					
Scottsville, Va.	20	15	16	23.0	16
Bremo Bluff, Va.	19	15	17	29.2	16
Columbia, Va.	10	14	19	35.2	16
State Farm, Va.	12	15	18	23.3	17
Richmond, Va.	8	16	18	19.5	17
Roanoke:					
Randolph, Va.	21	16	16	21.9	16
Weldon, N. C.	31	17	18	32.3	17
Williamston, N. C.	10	20	23	10.4	22
Tar: Rocky Mount, N. C.	8	12	12	8.1	12
		16	20	9.2	18
Neuse:					
Neuse, N. C.	14	16	19	15.8	18
Smithfield, N. C.	13	16	20	16.0	17-18
Goldsboro, N. C.	14	14	25	20.5	19
Kinston, N. C.	14	14	28	17.7	23

## MISSISSIPPI SYSTEM

## Upper Mississippi Basin

Mississippi:					
Hannibal, Mo.	13	4	6	13.3	5
Louisiana, Mo.	12	2	3	12.0	2-3

## Arkansas Basin

North Canadian: Canton, Okla.	6	21	23	7.7	21
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## WEST GULF OF MEXICO DRAINAGE

East Fork of Trinity: Rockwall (near), Tex.	10	18	19	10.4	19
Trinity:					
Dallas, Tex.	28	17	20	34.6	18-19
Trinidad, Tex.	28	24	25	28.3	25

<sup>1</sup> From flood mark.